FERC-0056

PLANNING STATUS REPORT

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WATER RESOURCES APPRAISAL
FOR HYDROELECTRIC LICENSING

PENOBSCOT RIVER BASIN

MAINE

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ELECTRIC POWER REGULATION
NEW YORK REGIONAL OFFICE

Revised August 1980

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PLANNING STATUS REPORT

WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING

This is one of a series of revised Planning Status Reports for major river basins in the United States. The original reports, which were prepared several years ago, are being revised as part of a program of Water Resources Appraisals for Hydroelectric Licensing. The revised reports provide updated information on water resources for use by the Federal Energy Regulatory Commission and its staff when considering hydroelectric licensing and other work. The reports present data on water resource developments, existing and potential, and on water use by existing and projected steam-electric generating facilities. The reports also summarize past and current planning studies. The information presented in these reports was abstracted from available sources and involved no new analyses. Information is current as of July 1980 unless otherwise indicated. The report is a staff effort which was not prepared for adoption or approval by the Commission, and does not commit or prejudice later Commission action. Although others contributed to the preparation, the primary author was Michael Janiszewski in the New York Regional Office.

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ELECTRIC POWER REGULATION
NEW YORK REGIONAL OFFICE

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THE PENOBSCOT RIVER BASIN

DESCRIPTION OF THE BASIN

The Penobscot River basin is located in central Maine between the watersheds of the Saint John River to the north, the St. Croix River to the east, and the Kennebec River to the west. The northwestern boundary of the basin forms a part of the international boundary between the United States and Canada. A river profile, figure 1, and a detailed basin map, figure 2, are included at the end of this report.

The basin has a maximum length in a north-south direction of about 125 miles, a maximum width of about 115 miles, and a total area of 8,570 square miles. It is the largest river basin in the State of Maine and the second largest in New England, being exceeded only by the Connecticut River basin. The Penobscot River is formed by the junction of its East and West Branches at Medway and follows a southerly course to tidewater at Bangor, a distance of 74 miles. It then continues 31 miles to its mouth at Turner (Steele Point) at the head of Penobscot Bay. In its 74-mile course between Medway and Bangor, the river falls a total of about 240 feet with a fairly uniform slope averaging 3.2 feet per mile. The principal headwater tributaries of the Penobscot River are the East and West Branches. The drainage area of those two tributaries account for nearly 39 percent of the total area of the Penobscot River basin. A 240-square mile area of the Allagash River in the Saint John River basin is diverted into the East Branch at the outlet of Chamberlain Lake. The three principal tributaries of the Penobscot River below Medway, in downstream order, are the Mattawamkeag, Piscataquis, and Passadumkeag Rivers.

Much of the Penobscot basin is upland with low, rolling hills rising above wide, flat valleys. Scattered throughout the basin, particularly in the northern portion, are monadnocks which rise to considerable elevations above the surrounding hills. The principal lowland of the basin is in the valley of the main river which extends from the estuary northward to Millinocket. There are numerous large and small lakes and ponds, their total area amounting to about 407 square miles, or about 5 percent of the basin area. The headwater lakes are at an elevation of 1,040 feet (msl). The surrounding hills vary in elevation from 1,500 to 1,800 feet with Mt. Katahdin rising to an elevation of 5,267 feet, the highest point in Maine. The Penobscot River, in its southerly course from Medway to Bangor, flows through a region of low relief, with the hills near the river reaching elevations of 300 to 400 feet.

The basin is subject to wide variations in the weather because of frequently conflicting air masses and cyclonic disturbances. These unsettled periods tend to be less frequent and less intense during the summer than during the remainder of the year. Occasional coastal storms occur, some of tropical origin traveling up the Atlantic Seaboard. The average annual temperature of the basin is about 42 degrees Fahrenheit, with a range of 50 degrees or more between the warmest and coldest months. Extremes in daily temperature range from summer highs in the 90's to winter lows in the -30's.

The average annual precipitation in the Penobscot River basin is approximately 41 inches, ranging from a minimum of 38 inches in the Mattawamkeag basin to a maximum of 45 inches in the Piscataquis basin. The distribution of precipitation is fairly uniform throughout the year. Annual snowfall throughout the basin varies from approximately 60 inches in the southern coastal region to more than 100 inches in the headwaters of the East and West Branch watersheds. The average runoff from the basin is about 1.7 cubic feet per second per square mile, equivalent to approximately 22 inches per year or 54 percent of the mean

annual precipitation. Over 40 percent of the runoff occurs in the months of March, April, and May, with the remainder being rather uniformly distributed throughout the rest of the year.

The Penobscot River basin is predominantly rural with a permanent population in 1975 of about 154,000. Although the basin covers approximately one-quarter of the State, it accounts for only 15 percent of the population and has an average density of 18 people per square mile. Most of the population is concentrated in the southern portion of the basin, particularly in communities adjacent to the Penobscot and Piscataquis Rivers, while the northern portion of the basin consists primarily of sparsely populated, unorganized townships. Almost half of the basin's population is concentrated in six towns. These towns, Bangor, Orono, Brewer, Old Town, Millinocket, and Hampden, comprise only 2 percent of the basin's land area and contain a total of 73,000 people. Portions of seven counties are located in the Penobscot basin, including Somerset, Piscataquis, Penobscot, Waldo, Hancock, Washington, and Aroostook Counties, with the majority of the basin being located in Penobscot and Piscataquis Counties.

Given the predominance of forest cover in the region, agricultural land use is limited in the Penobscot River basin, covering less than 10 percent of the land base. Eighty percent of the basin's farmland is located in Penobscot County, with the most intensively farmed areas located northwest of Bangor in the Kenduskeag watershed. Primary crops are potatoes and corn silage, the latter to support the area's dairy industry. To a lesser degree, poultry, blueberries, and vegetable farming are also practiced in the county. In Piscataquis County, farming is confined to the Piscataquis watershed in areas east of Dover-Foxcroft, with potato and dairy operations comprising the dominant activities. Paralleling regional trends, farming in the basin has experienced a decline. Between 1964 and 1974, the number of farms in the two counties has decreased from 1,475 to 720 and acreage from 243,455 to 191,622.

Lumbering has been a very important activity in the Penobscot River basin for some 150 years. The timber formerly cut in the basin was utilized in the construction of boats, production of building lumber, and the manufacture of wood products. At the present time, the principal markets for the basin's timber are provided by the pulp and paper industries. The important species of trees in the basin include, spruce, fir, pine, maple, beech, and birch.

The industrial life of the basin in the past was generally associated with forest resources and related manufacture. Manufacturing, the major industry, now accounts for less than 50 percent of the basin's employment with pulp and paper manufacturing still dominant. Other important industries include leather, lumber and wood products, food, and textiles.

The abundance of high quality lakes and streams and the predominantly rural and undeveloped nature of the upper portion of the Penobscot River basin offer a wide range of recreational opportunities. The natural features of the basin afford an excellent habitat for fish and game, which in turn attract large numbers of hunters and fishermen. The value of these resources has been acknowledged by the preservation of two major areas. One is Baxter State Park located, between the East and West Branches, about 25 miles northwest of Millinocket. The park is a wilderness area of about 200,000 acres containing many lakes, ponds, and mountain peaks, including Mt. Katahdin. The other is the Allagash Wilderness Waterway, a portion of which is located in the basin and includes

DESCRIPTION OF THE BASIN

Telos, Chamberlain, and Allagash Lakes. The principal recreation attractions in the lower part of the basin are the more readily accessible lakes and streams which afford opportunities for fishing, boating, camping, and picnicking. Fort Knox State Park at the site of the fort erected near the mouth of the river in 1864 is a popular tourist attraction.

EXISTING WATER RESOURCE DEVELOPMENTS

There are no Federal reservoir projects in the Penobscot River basin and none has been authorized. A commercial navigation channel is maintained by the Corps of Engineers in the tidal portion of the Penobscot River between Bangor and Penobscot Bay.

There are an abundance of water storage facilities in the Penobscot River basin in the form of lakes, reservoirs, and ponds which vary in size from less than 100 to greater than 100,000 acre-feet. Table 1 presents a summary of the major (10,000 acre-feet or greater) storage projects in the basin. About 80 percent

Table 1

Major Reservoir Storage
Penobscot River Basin

Reservoir	Drainage Area (sq mi)	Dam Height (ft)	Usable Storage Capacity (ac-ft)
East Branch Penobscot River			
Telos Lake 1/	240	10	115,000
Grand Lake Matagamon	484	NA	40,900
Allagash Lake	79	NA	32,500
Total East Branch			188,400
West Branch Penobscot River			
Canada Falls	164	26	23,400
Seboomook Lake	469	32	157,000
Caucomgomoc	165	8	32,400
Ragged Lake	34	22	33,200
Ripogenus Lake 2/	1,410	186	688,000
North Twin Lake 3/	1,870	29	344,300
Millinocket Lake	112	7	45,900
Total West Branch			1,324,200
Piscataquis River			
Wilson Ponds	36	15	12,000
Sebec Lake	344	15	57,600
Schoodic Lake	43	7	37,400
Seboeis Lake	--	9	42,400
Total Piscataquis River			149,400
	Basin Total		1,662,000

1/ *Controls Chamberlain Lake Telos Lake, and Round Pond.*
2/ *Controls Chesuncook, Ripogenus, and Caribou Lakes.*
3/ *Controls Ambajejus, Pemadumcook, North Twin, South Twin, and Elbow Lakes.*

of the storage from these projects is located in the West Branch watershed provided largely by the Ripogenus and North Twin Lakes. Most of the storage on the East and West Branches is operated by the Bangor Hydro-Electric Company and the Great Northern Nekoosa Corporation (formerly Great Northern Paper Company), respectively. West Branch storage is used to provide a minimum continuous flow of 2,000 cubic feet per second at Millinocket. Most of the storage in the Piscataquis River watershed is owned and operated by the Bangor Hydro-Electric Company for the benefit of its downstream hydroelectric powerplants on the Piscataquis and Penobscot Rivers.

As shown in table 2, there are 20 existing hydropower developments in the basin including five storage projects that regulate streamflow for the benefit of downstream hydropower generation. The tabulated installations have a total installed capacity of 152,227 kilowatts. The Bangor Hydro-Electric Company, the only electric utility with generating capacity in the basin, owns developments with a total capacity of 28,197 kilowatts and industrial establishments operate projects with capacities totaling 124,030 kilowatts. The above capacities include 30,870 kilowatts as the equivalent of 41,388 horsepower in mechanical drive units. Seven existing developments also have undeveloped capacities totaling 11,060 kilowatts.

Bangor Hydro-Electric Company's oil-fired Graham Station, with a generating capacity of 57,450 kilowatts, is the only steam-electric plant located in the Penobscot River basin. In 1977, the gross generation from this plant was approximately 8.5 million kilowatt-hours. Water for the station's once-through cooling system is taken from the Penobscot River, and in 1977, the average amount withdrawn was 1.4 million gallons per day with negligible consumption.

Table 2

Existing Hydropower Developments
Penobscot River Basin

Map No.	Project Name	River	Class 1/	Owner 2/	Drainage Area (sq mi)	Usable Storage Capacity (ac-ft)	Gross Head (ft)	Installed Capacity (kW)	FERC Project No.
1	Veazie	Penobscot	U	BAHE	7,800	3,500	18	8,400	2403
2	Orono	Stillwater	U	BAHE	7,710	810	25	2,332	2710
3	Stillwater	Stillwater	U	BAHE	7,600	3,000	18	1,950	2712
4	Great Works	Penobscot	I	DINT	7,680	1,500	19	5,554	2312
5	Milford	Penobscot	U	BAHE	7,600	9,180	20	6,400	2534
6	Howland	Piscataquis	U	BAHE	1,500	3,400	16	1,875	2721
7	Greenville	Wilson Stream	I	GNANC	40	--	35	576	--
8	Stanford	Penobscot	U	BAHE	5,100	10,500	21	3,800	2600
9	Mattaceunk	Penobscot	I	GNNA	3,308	22,000	40	19,200	2520
10	Medway	W. Br. Penobscot 6/	U	BAHE	2,120	1,500	19	3,440 5/	2666
11	E. Millinocket	W. Br. Penobscot 6/	I	GNNA	2,083	800	30	7,370 4/	2458
12	Millinocket Lake	Millinocket Stream	I	GNNA	112	45,900	--	-- 5/	2458
13	Dolby	W. Br. Penobscot 6/	I	GNNA	2,080	46,000	49	14,100 5/	2458
14	Millinocket	W. Br. Penobscot 6/	I	GNNA	1,880	10,000	110	31,500 3/	2458
15	North Twin	W. Br. Penobscot 6/	I	GNNA	1,870	344,300	29	8,200	2458
16	Ripogenus	W. Br. Penobscot 6/	I	GNNA	1,410	688,000	106	37,530	2572
17	Ragged Lake	Ragged Stream	I	GNNA	34	33,200	--	-- 5/	2634
18	Caucomgomoc	Caucomgomoc	I	GNNA	165	32,400	--	-- 5/	2634
19	Seboomook	W. Br. Penobscot 6/	I	GNNA	469	157,000	--	-- 5/	2634
20	Canada Falls	W. Br. Penobscot 6/	I	GNNA	164	23,400	--	-- 5/	2634
				Total		1,436,390		152,227	

1/ U-Privately-owned utility; I-Industrial.
2/ BAHE-Bangor Hydro-Electric Co.; DINT-Diamond International; GNANC-Greenville Manufacturing Co.; GNNA-Great Northern Nekoosa Corp.
3/ Includes 8,000 kW generating and 23,500 kW equivalent of 31,500 HP in mechanical power.
4/ 7,870 kW equivalent of 9,988 HP in mechanical power.
5/ Projects have undeveloped capacities: Medway, 700 kW; Millinocket Lake, 420 kW; Dolby, 2,560 kW; Ragged Lake, 220 kW; Caucomgomoc, 550 kW; Seboomook, 6,920 kW; Canada Falls, 1,380 kW.
6/ River segment is under study for inclusion in the National Wild and Scenic Rivers System by P.L. 90-542, section 5(a)

STATUS OF HYDROELECTRIC LICENSING

Of the 20 existing hydropower developments in the Penobscot River basin shown in table 2, only one, Greenville project, does not have license status. There are 11 outstanding licenses covering 18 existing hydropower developments in the basin. There is pending before the Commission a license application for the Howland project of the Bangor Hydro-Electric Company. Table 3 summarizes the status of hydroelectric licensing for projects in the Penobscot River basin.

Table 3

Status of Hydroelectric Licensing
Penobscot River Basin

Project Name	FERC Project No.	Type	Status	Date of License Expiration
Existing Projects				
Veazie	2403	major license	outstanding	12-31-87
Orono	2710	major license	outstanding	12-31-93
Stillwater	2712	major license	outstanding	12-31-93
Great Works	2312	major license	outstanding	12-31-93
Milford	2534	major license	outstanding	12-31-90
Howland	2721	major license	pending	
Stanford	2600	major license	outstanding	12-31-87
Mattaceunk	2520	major license	outstanding	12-31-87
Medway	2666	major license	outstanding	3-31-99
E. Millinocket	2458	major license	outstanding	12-31-93
Millinocket Lake	2458	major license	outstanding	12-31-93
Dolby	2458	major license	outstanding	12-31-93
Millinocket	2458	major license	outstanding	12-31-93
North Twin	2458	major license	outstanding	12-31-93
Ripogenus	2572	major license	outstanding	12-31-93
Ragged Lake	2634	major license	outstanding	4-30-00
Caucomgomoc	2634	major license	outstanding	4-30-00
Seboomook	2634	major license	outstanding	4-30-00
Canada Falls	2634	major license	outstanding	4-30-00
Potential Projects				
The Arches	3237	preliminary permit	pending	
Gordon Falls	3236 1/	preliminary permit	pending	
Marsh Island	3238 2/	preliminary permit	pending	

1/ Project would be located in the reservoir of the potential Stratton Rips project shown in table 4.

2/ Project would be located in the reservoir of the potential Basin Mills project shown in table 4.

STATUS OF HYDROELECTRIC LICENSING

Gordon Falls Hydro Associates filed on July 3, 1980, an application for preliminary permit for the proposed Gordon Falls project (FERC Project No. 3236) located on Mattawamkeag River, near the Town of Kingman, Penobscot County. The proposed project would have an installed capacity of 15,900 kilowatts with a gross head of 40 feet. The usable storage of the reservoir would be 15,740 acre-feet at a normal pool elevation of 340 feet msl. The proposed Gordon Falls project would be located in the reservoir of the potential Stratton Rips project shown in table 4.

Penobscot Hydro Associates filed on July 3, 1980, an application for preliminary permit for the proposed Arches project (FERC Project No. 3237) located on the West Branch of the Penobscot River. The normal pool elevation of the proposed run-of-the-river project would be 760 feet msl. Other project data are shown in table 4.

Marsh Island Hydro Associates filed on July 3, 1980, an application for preliminary permit for the proposed Marsh Island project (FERC Project No. 3238) located on the Penobscot River, near the Town of Orono, Maine. The proposed project would have an installed capacity of 29,600 kilowatts with a gross head of 15 feet. The normal pool elevation of the proposed run-of-the-river project would be 62 feet msl. The proposed Marsh Island project would be located in the reservoir of the potential Basin Mills project shown in table 4 and on figure 2.

WATER RESOURCES PLANNING

Prior Studies and Reports

The "308" report of the Corps of Engineers on the Penobscot River basin, published in 1930 as House Document No. 652, 71st Congress, 3rd Session, concluded that the development of the basin for the combined purposes of navigation, flood control, power development, and irrigation was not economically feasible at that time. Therefore, no improvements were recommended.

The New England-New York Inter-Agency Committee (NENYIAC) study and report was completed in 1955 and published as Senate Document No. 14, 85th Congress, 1st Session. The report, authorized by the Flood Control Act of 1950, presents the results of a comprehensive survey of the land and water resources of the New England-New York region. Twenty-eight river basins were investigated, including the Penobscot. The report cites: the outstanding needs of the Penobscot River basin to control pollution; measures to meet growing demands for recreation; measures to conserve and improve the forests; further development of hydroelectric power; and additional storage for stream flow regulation in the interest of power, pollution abatement, recreation, water supply, and incidental flood control.

The Wild and Scenic Rivers Act (P.L. 90-542) designated, in section 5(a), East and West Branches of the Penobscot River for study as possible additions to the National Wild and Scenic Rivers System. The Department of the Interior was responsible for the study. The study results were presented in a 1975 Department of the Interior's proposed report on the Penobscot River and a 1976 draft environmental impact statement for the proposed Penobscot Wild and Scenic River. These documents recommend that excluding the West Branch's lower lakes (Pemadum-

cook, Ambajejus, North Twin, and South Twin) and the lower 15-mile segment of the West Branch between North Twin Station and Medway, the remaining West Branch and the East Branch of the Penobscot River be designated as a State-administered national wild and scenic river. The staff of the Federal Power Commission studied these documents and, by letter of February 18, 1976, from its Chairman to the Secretary of the Interior, the Commission concluded that the proposed wild and scenic river designation of the East and West Branches of the Penobscot River would conflict with the possible future development of hydroelectric power, and that the possible power benefits foregone should be thoroughly considered in deciding whether or not to include the rivers in the National Wild and Scenic Rivers System.

A report, "New England Hydroelectric Development Potential," dated June, 1976, prepared by the New England Federal Regional Council, Energy Resources Development Task Force-Hydroelectric Facilities Workgroup, for the Federal Energy Administration, discussed the hydroelectric development potential in the New England area. The report reviewed and updated the NENYIAC study of 1955 using 1976 cost factors. The report also mentions up to 450 potentially feasible, small hydro sites in New England which could provide a total capacity of up to 180,000 kilowatts. Concerned with proposed developments which have benefit-cost ratios (B/C) greater than 0.6, the report found four projects in the Penobscot River basin which either are presently economically feasible (B/C>1.0) or will possibly be so in the near future (B/C>0.6). These projects are Arches (B/C = 1.22), Basin Mills (B/C = 1.17), Sourdnahunk (B/C = 0.93), and Winn (B/C = 0.86).

The Water Resources Planning Act of 1965 (P.L. 89-80) authorizes the Water Resources Council to maintain a continuing study of the Nation's water and related land resources and to prepare periodic assessments to determine the adequacy of these resources to meet present and future water requirements. The Council reported its first national assessment in 1968, which put into nationwide perspective estimates of present and future regional water and related land requirements and supplies. The Second National Water Assessment, published by the Council in December 1978, presents nationally consistent current and projected water use and supply information by regions and subregions for the United States. The second assessment found that significant achievements have been made in the past decade in preserving water and harnessing its power with a growing interest in water conservation and environmental protection; and that greater efforts are needed to insure careful management of our water resources and to solve the complex water and related land problems which still exist. A supplemental report to the second assessment, Water for Energy, provides information on energy and related water requirements at the region and subregion level for the years 1975, 1985, and 2000, including cooling water requirements for steam-electric generation.

Present Studies

The New England River Basins Commission (NERBC) is preparing overview reports on each of the region's major river basins. Each overview will establish a uniform information base on water resources, including an assessment of the problems associated with the use of basin resources, a description of existing water resource management programs, and recommendations for new approaches to problem resolution. The overviews will help coordinate State, interstate, and Federal planning efforts and provide the basis for the NERBC to set annual priorities of water resources problems needing Federal funding. A preliminary draft of the "Penobscot River Basin Overview" is currently under review at NERBC.

WATER RESOURCES PLANNING

The Corps of Engineers in conjunction with the Department of Energy is currently conducting a detailed assessment of the Nation's hydroelectric power resources as part of the National Hydroelectric Power Resources Study authorized by section 167 of the Water Resources Development Act of 1976 (P.L. 94-587). The study is designed to provide a current and comprehensive estimate of the hydropower potential at existing dams as well as for undeveloped sites in the United States. In addition, the study will address the demand for hydroelectric power and will investigate various related policy and technical considerations to determine the incentives, constraints, and impacts of developing hydropower to meet future energy demands. When completed in 1981, the study will provide a more detailed evaluation of the Nation's hydroelectric power resources and will serve as a framework for future planning and development of this important resource. As an initial phase of this study, the Corps' Institute for Water Resources has prepared a series of regional reports, Preliminary Inventory of Hydropower Resources, which provide preliminary estimates of the existing and potentially feasible hydroelectric power resources in the United States, and briefly evaluate their regional significance. In volume 6, of the inventory, Northeast Region, July 1979, there are 37 possible hydropower developments in the Penobscot River basin with capacities greater than 50 kilowatts. The total potential is estimated to be about 70,000 kilowatts.

NERBC is currently conducting a special study to investigate the feasibility and implications of expanding hydropower use in New England. The study was authorized by the Water Resources Council in August 1977 and is scheduled for completion in 1981. Study objectives are to identify the hydropower potential that exists and then determine a reasonable level of hydropower expansion that could be acceptable to New England, from the standpoint of environmental and social impacts on other water resource interests. As a by-product of the study, guidelines are to be prepared for the region's consideration of specific hydropower development opportunities. In meeting these objectives, the study is designed to coordinate with parallel efforts being conducted at the national level by the Corps of Engineers and the Department of Energy. The study will provide New England with its own assessment capability.

POTENTIAL WATER RESOURCE DEVELOPMENTS

There are no potential reservoirs or power projects in the Penobscot River basin which have been authorized by Congress for Federal construction.

There are significant potentials for hydroelectric power developments in the Penobscot River basin as shown in table 4. Future investigations may also identify potential hydroelectric power at existing non-power dams. In addition, the retired hydropower projects, shown in table 5, have potential for redevelopment due to changing economic and environmental considerations.

The Allagash Wilderness Waterway, part of which is located in the Penobscot River basin, is a component of the National Wild and Scenic Rivers System designated by section 2(a) of the Wild and Scenic Rivers Act of 1968. It affects no known potential hydroelectric power development in the basin.

POTENTIAL WATER RESOURCE DEVELOPMENTS

The East and West Branches of the Penobscot River have been under study for inclusion in the National Wild and Scenic Rivers System. The inclusion, which requires an Act of Congress, would preclude future development of hydroelectric power in the East and West Branches.

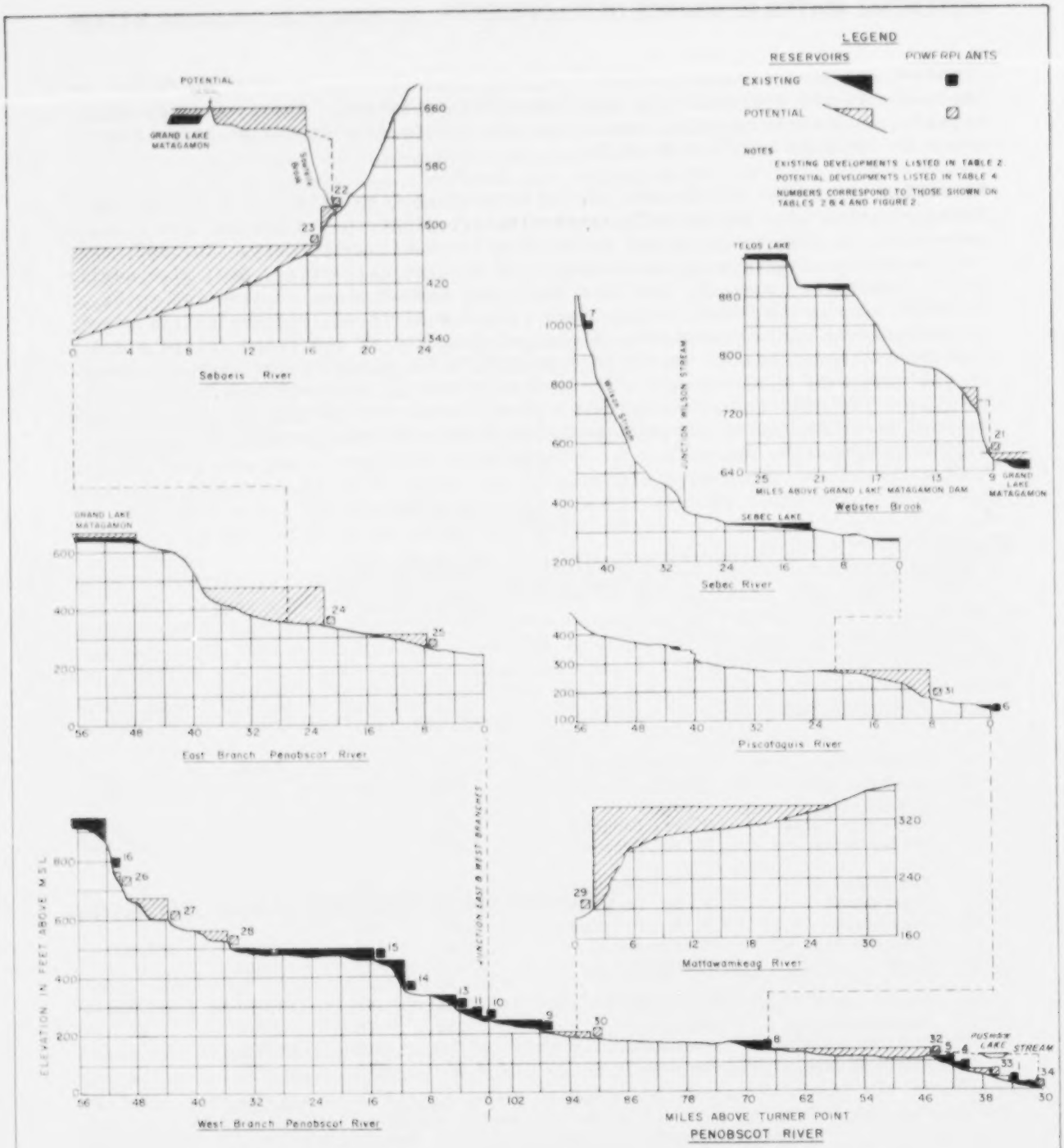
According to the Second National Water Assessment, the existing 57,450-kilowatt Graham Station will be the only steam-electric plant in the basin. The annual generation in 1985 is estimated to be 70 million kilowatt-hours. In 1985, the cooling water withdrawn is estimated at 19 million gallons per day, with negligible consumptive use. By the year 2000, the Graham plant is expected to be retired and the 568,000-kilowatt Sears Island coal-fired, steam-electric plant is expected to be in operation. The final location of the Sears Island plant has not yet been chosen, but it is expected to be located in or near the basin to the northeast of Searsport. The estimated annual generation for the year 2000 is 2,736 million kilowatt-hours. Cooling water withdrawn is from Penobscot Bay and is estimated at 111 million gallons per day and consumptive use at 1 million gallons per day.

Table 4

Potential Hydroelectric Power Projects
Penobscot River Basin

Map No.	Project Name	River	Drainage Area (sq mi)	Gross Head (ft)	Potential Capacity (kW)	Usable Storage Capacity 1/ (ac-ft)
21	Grand Pitch	Webster Brook 2/	280	90	5,000	U
22	Sawtelle Falls	Sawtelle Brook 2/	548	140	15,000	140,000
23	Grand Falls	Seboeis	686	50	6,000	U
24	Whetstone Falls	E. Br. Penobscot 2/	985	135	30,000	255,000
25	Meadow Brook	E. Br. Penobscot 2/	1,070	50	12,000	U
26	The Arches 3/	W. Br. Penobscot 2/	1,415	90	33,600	U
27	Sourdnahunk	W. Br. Penobscot 2/	1,435	95	24,000	U
28	Debsconeag	W. Br. Penobscot 2/	1,545	58	15,000	U
29	Stratton Rips 4/	Mattawamkeag	1,484	140	40,000	863,000
30	Winn	Penobscot	4,870	23	12,000	U
31	Bonnie Brook	Piscataquis	1,254	91	20,000	57,000
32	Sunkhaze Rapids	Penobscot	7,268	28	12,000	U
33	Basin Mills 5/ 6/	Penobscot	7,750	27	12,000	U
34	Bangor Diversion 7/	Penobscot	8,000	115	40,000	U
			Totals		276,600	

1/ *U-less than 5,000 acre-feet of storage capacity.*
2/ *River segment is under study for inclusion in the National Wild and Scenic Rivers System by Public Law 90-542, section 5(a).*
3/ *FERC Project No. 3237. Preliminary permit application pending.*
4/ *The Gordon Falls project, FERC Project No. 3236, would be located in Stratton Rips reservoir. Preliminary permit application for Project No. 3236 is pending.*
5/ *The Marsh Island project, FERC Project No. 3238, would be located in Basin Mills reservoir. Preliminary permit application for Project No. 3238 is pending.*
6/ *Would inundate existing Orono project.*
7/ *Diverts from Sunkhaze Rapids.*

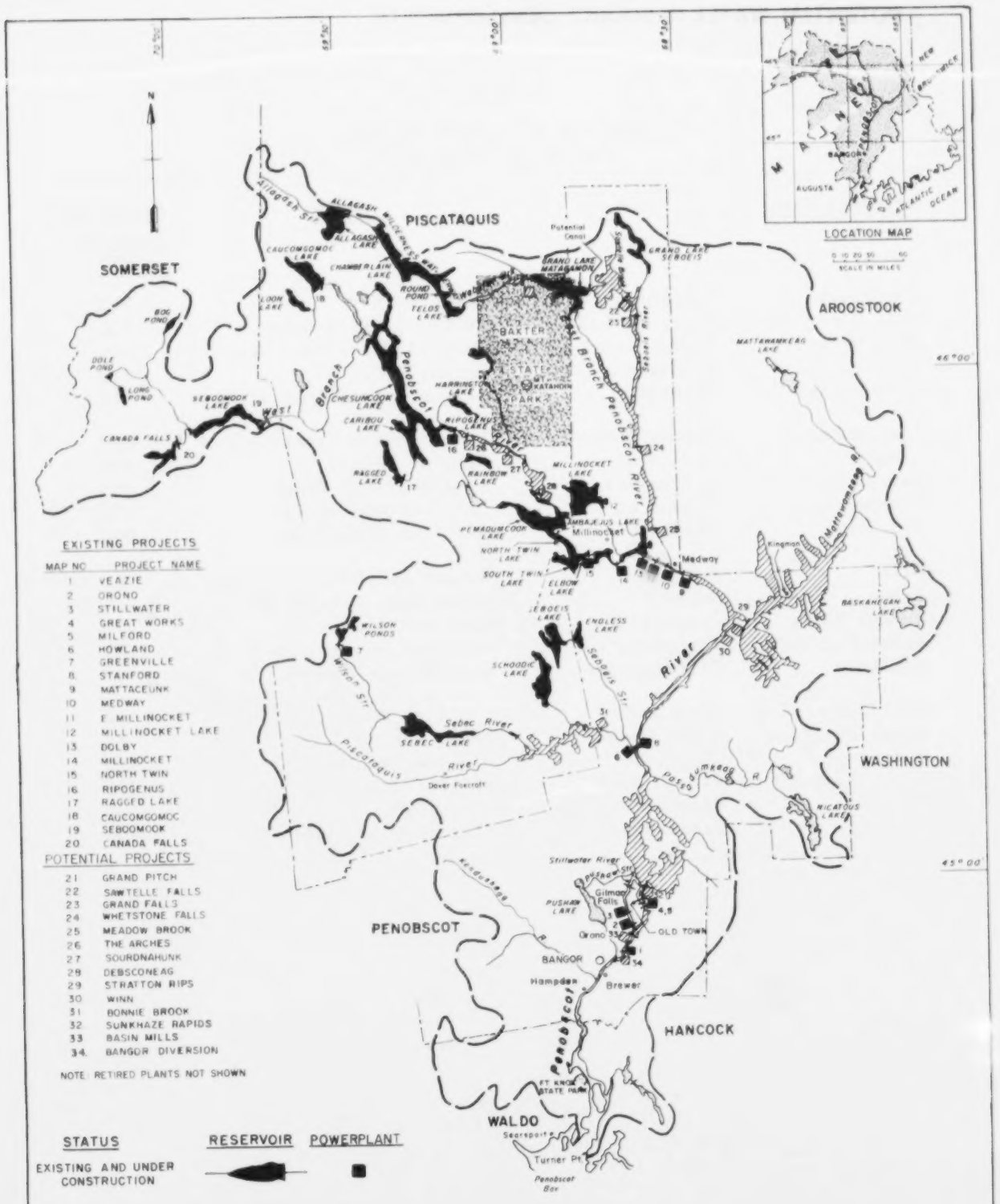


PROFILES

PENOBSCOT RIVER BASIN

FERC – Water Resources Appraisals For Hydroelectric Licensing

FIGURE 1



FERC — Water Resources Appraisals For Hydroelectric Licensing

FIGURE 2

Table 5

Retired Hydropower Projects
Penobscot River Basin

Project Name	River	Owner	Installed Capacity (kW)
Penobscot	Penobscot Trib.	Page, Blin W.	452
West Winterport	Marsh Stream	Walter Clark & Sons	120
East Orland	Toddy Pond	Central Maine Pwr. Co.	500
Corinth	Kenduskeag Stream	Duran, L.F.	112
Iron Works	Penobscot	Bangor Hydro-Electric Co.	120
Little Falls	Pennamaquon	Bangor Hydro-Electric Co.	160
Bangor	Penobscot	City of Bangor	700
Wester Mill	Stillwater	International Paper	2,550
Nekonegan	Penobscot	Old Town Woolen Co.	150
Old Town	Penobscot	Old Town Woolen Co.	4,000
Milo	Sebec	Bangor Hydro-Electric Co.	320
Sebec	Sebec	Maine Pub. Service Co.	1,000
Browns Mills	Piscataquis	American Woolen Co.	477
Dover Foxcroft	Piscataquis	American Woolen Co.	854
Guilford	Piscataquis	Piscataquis Woolen	150
Guilford	Piscataquis	Old Town Woolen Co.	100
North Guilford	Davis Brook	Penobscot Dev. Co.	75
Sangerville	Carleton	Old Town Woolen Co.	100
North Monmouth	Wilson Pond	Wilton Woolen Co.	250
Outlet	Wilson Pond	Bass, G.H.	75
Danforth	Baskahegan	Kingman Elec. Coop.	100

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